USEFUL FOR UNIVERSITY EXAMS, GATE, NET AND OTHER CS EXAMS

DATABASE MANAGEMENT SYSTEM

RELATIONAL ALGEBRA with EXAMPLE

PROPER NOTES IN PPT FORM

PART - 10



Relational Algebra

- Relational algebra is a procedural query language.
- In this we have to give a step by step process to obtain the result of the query.
- It uses operators to perform queries.

1. Select Operation:

- The select operation selects tuples that satisfy a given predicate(condition).
- It is denoted by sigma (σ).
- Notation: $\sigma\ p(r)$

  Here :

σ is used for selection operator for tuples.
r is used for relation
p is used as a propositional logic formula which may use connectors like: AND OR and NOT. These relational can use as relational operators like =, ≠, ≥, <, >, ≤.

EXAMPLE

- Consider the following relational database schema consisting of the four relation schemas:

passenger (pid, pname, pgender, pcity)

agency (aid, aname, acity)

flight (fid, fdate, time, src, dest)

booking (pid, aid, fid, fdate)

- **Get the complete details of all flights to New Delhi.**

$\sigma_{\text{destination = "New Delhi"}}$ **(flight)**

Project Operation:

- This operation shows the list of those attributes that we wish to appear in the result. Rest of the attributes are eliminated from the table.
- It is denoted by ∏.
- Notation: ∏ A1, A2, An (r)
- **Where**

A1, **A2**, **A3** is used as an attribute name of relation **r**.

- EXAMPLE : ∏ NAME, CITY (EMPLOYER)

Union Operation:

- Suppose there are two relaions R and S.
- The union operation contains all the tuples that are either in R or S or both in R & S.
- It eliminates the duplicate tuples. It is denoted by ∪.
- R and S must have the attribute of the same number.
- Duplicate tuples are eliminated automatically.
- EXAMPLE :

∏ CUSTOMER_NAME (BORROW) ∪ ∏ CUSTOMER_NAME (DEPOSITOR)

Set Intersection:

- Suppose there are two relations R and S.
- The set intersection operation contains all tuples that are in both R & S.
- It is denoted by intersection ∩.
- Notation: R ∩ S

EXAMPLE:

∏ CUSTOMER_NAME (BORROW) ∩ ∏ CUSTOMER_NAME (DEPOSITOR)

Set Difference:

- Suppose there are two relations R and S.
- The set intersection operation contains all tuples that are in R but not in S.
- It is denoted by intersection minus (-).
- Notation: R - S

EXAMPLE:

∏ CUSTOMER_NAME (BORROW) - ∏ CUSTOMER_NAME (DEPOSITOR)

Cartesian product

- The Cartesian product is used to combine each row in one table with each row in the other table.
- It is also known as a cross product.
- It is denoted by X.
- Notation: E X S

Example

EMP_CODE	EMP_NAME
101	A
102	B
103	C

EMP_CODE	SALARY
101	1000
102	2000
103	3000

e.EMP_CODE	e.EMP_NAME	s.Emp_CODE	s.SALARY
101	A	101	1000
101	A	102	2000
101	A	103	3000
102	B	101	1000
102	B	102	2000
102	B	103	3000
103	C	101	1000
103	C	102	2000
103	C	103	3000

Join Operations:

- A Join operation combines related tuples from different relations, if and only if a given join condition is satisfied.
- It is denoted by $\bowtie$.

Example

EMP_CODE	EMP_NAME
101	A
102	B
103	C

EMP_CODE	SALARY
101	1000
102	2000
103	3000

e.EMP_CODE	e.EMP_NAME	s.Emp_CODE	s.SALARY
101	A	101	1000
101	A	102	2000
101	A	103	3000
102	B	101	1000
102	B	102	2000
102	B	103	3000
103	C	101	1000
103	C	102	2000
103	C	103	3000

EXAMPLES

- Consider the following relational database schema consisting of the four relation schemas:

passenger (pid, pname, pgender, pcity)

agency (aid, aname, acity)

flight (fid, fdate, time, src, dest)

booking (pid, aid, fid, fdate)

- **Get the details about all flights from Chennai to New Delhi.**

$\sigma_{src = \text{"Chennai"} \wedge dest = \text{"New Delhi"}} (\text{flight})$

EXAMPLES

- Consider the following relational database schema consisting of the four relation schemas:

passenger (pid, pname, pgender, pcity)

agency (aid, aname, acity)

flight (fid, fdate, time, src, dest)

booking (pid, aid, fid, fdate)

- **Find only the flight numbers for passenger with pid 123 for flights to Chennai before 06/11/2020.**

$\Pi_{fid} (\sigma_{pid = 123} (booking) \bowtie \sigma_{dest = \text{“Chennai”} \wedge fdate < 06/11/2020} (flight))$

Given conditions are pid, dest, and fdate. To get the flight id for a passenger given a pid, we have two tables flight and booking to be joined with necessary conditions. From the result, the flight id can be projected]

EXAMPLES

- Consider the following relational database schema consisting of the four relation schemas:

passenger (pid, pname, pgender, pcity)

agency (aid, aname, acity)

flight (fid, fdate, time, src, dest)

booking (pid, aid, fid, fdate)

- **Find the passenger names for passengers who have bookings on at least one flight.**

Π_{pname} (passenger ⋈ booking)

EXAMPLES

- Consider the following relational database schema consisting of the four relation schemas:

passenger (pid, pname, pgender, pcity)

agency (aid, aname, acity)

flight (fid, fdate, time, src, dest)

booking (pid, aid, fid, fdate)

- **Find the passenger names for those who do not have any bookings in any flights.**

$\Pi_{pname} ((\Pi_{pid} (passenger) - \Pi_{pid} (booking)) \bowtie passenger)$

here applied a set difference operation. The set difference operation returns only pids that have no booking. The result is joined with passenger table to get the passenger names

EXAMPLES

- Consider the following relational database schema consisting of the four relation schemas:

passenger (pid, pname, pgender, pcity)

agency (aid, aname, acity)

flight (fid, fdate, time, src, dest)

booking (pid, aid, fid, fdate)

- **Find the agency names for agencies that located in the same city as passenger with passenger id 123.**

$\Pi_{aname} (agency \bowtie_{acity = pcity} (\sigma_{pid = 123} (passenger)))$

THANK YOU

